

Historic American Engineering Record

OH-11

The Cleveland Automobile Industry
Methods and Facilities 1898-1932

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Historical Report

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Heritage Conservation and Recreation Service
US Department of Interior
Washington, DC 20243

The Cleveland Automobile Industry
Methods and Facilities
1898.- 1932
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NAME: Cleveland Automobile Industry

LOCATION: Cleveland, Ohio

DATE OF SETTLEMENT: 1898

PRESENT OWNER: Municipal and Private Ownership

PRESENT USE: Industrial and Adaptive Use

SIGNIFICANCE: Cleveland Automobile Industry incorporated innovations in assembly techniques and factory architecture, and reflected the rise and fall of the Ohio automobile industry.

HISTORIAN: Tom Fisher

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The Cleveland Automobile Industry
Methods and Facilities
1898 - 1932

On June 7, 1909, a writer for the Cleveland Plain Dealer commented that "the growth of the automobile business in Cleveland is truly marvelous. One can not appreciate the way the industry has spread until a study of it has been made." ¹ The following paper attempts just that - to examine the automobile industry in Cleveland, Ohio from its inception in 1898 to its demise in 1932.

The Cleveland auto industry has been the subject of much interest and research in recent years. For example, Richard Wager's book, Golden Wheels - The Story of the Automobiles made in Cleveland and Northeastern Ohio - 1892-1932 ² covers the business history of each company and describes its automobiles in detail. Although this paper draws from Mr. Wager's research, it hopes to be complimentary rather than derivative.

The following paper will proceed in two parts. Part I will present a general history of the Cleveland automobile industry - why it arose, how it developed, and why it failed. It will focus upon general changes in the manufacturing methods, factory designs, and labor relations of the Cleveland industry. Part II will follow with detailed studies on the major companies that operated in Cleveland. It will focus upon their manufacturing methods and facilities in greater detail and relate that information to the business history of each company. Part II, then, will give specific reasons for the general trends outlined in Part I.

By the end of the 19th century, Cleveland had earned a

reputation as "The City of Diversified Industries." Not just³
a leading producer in several industries, Cleveland manufactured⁴
a greater variety of products than any other United States city.
The diversity increased in the early 20th century until, by 1930,
Greater Cleveland was called the nation's "15th industrial state,"
a leader in 210 out of the 333 types of manufacturing.⁵

Cleveland's industrial diversity sided the city's early
automobile industry in several ways. For example, many of the
city's leading products were essential to the manufacture of
cars. Steel, wire, fasteners, machine tools, precision instruments,
batteries, oil, paint, and varnish led the list Cleveland's auto-
supply industries. With the inclusion of Akron's rubber industry
and Canton's bearings industry, as well as secondary Cleveland
industries such as brass foundries, leather goods, and wood products,
the automobile industry in Cleveland had no lack of material resources.⁶

But suppliers can not create an industry. The initial capital,
the skilled labor and the mechanical knowledge essential to the
early automobile industry came from two other leading Cleveland
industries - carriage and bicycle manufacturing.

By the last quarter of the 19th century, Cleveland had become
the leading producer of wagons and high-priced carriages in Ohio.
Much of the labor and skill for the industry came from the city's
large ethnic population. Much of the market resided with Cleveland's
wealthy industrialists and their families. For example, leading
Cleveland families such as the Mathers and the Hannas patronized

Cleveland's Rauch and Lang Carriage Company, a manufacturer of expensive carriages. Rauch and Lang, along with companies such as the W. H. Gabriel Carriage and Wagon Company and the Ohio Trailer Company, later made automobiles.⁷

The auto industry's true ancestors were not carriages, but bicycles. Cleveland's bicycle industry began in the 1880's, and skyrocketed in the early 1890's when bicycling became a national fad. Over a dozen important companies manufactured bicycles in Cleveland. Of these, the Winton, White, Peerless, Lozier, Koningslow, DeMars, McIntosh, and Hoffman companies⁸ later produced motor vehicles.

Cleveland's bicycle companies were not just large in number. In the 1890's, they became large in size. The Winton Bicycle Company produced, at its peak, 6000 bikes per year; the Otto Koningslow Bicycle Company, 8,000 per year; and the White Sewing Machine Company, 10,000 per year.⁹ Such large scale production demanded equally large investments in machinery, an asset which proved a liability when the recession of 1893 ended the bicycle fad. Manufacturers went searching for a new product for their machinery, and the motor vehicle, first shown in the United States at the 1893 World's Columbian Exposition, offered the most promising alternative. The demise of one industry became the impetus for another.

Many of Cleveland's bicycle manufacturers were also mechanical engineers and inventors, holding patents for such innovations as

steel-tube frames, chain drive, differential gearing, and pneumatic tires. Alexander Winton alone held six patents on the bicycle, including ball and roller bearings and spring-¹⁰ supported seats. Most of those inventions played a part in the development of the early Cleveland automobiles.

If the carriage and bicycle industries were the auto industry's ancestors, Cleveland's railroad system enabled it to grow. In the 19th century, the city became one of the major ports on the Great Lakes. With that port grew the railroads. By the early 20th century, Cleveland had seven trunk lines, thirty-nine freight stations, twenty-two passenger stations, and six interurban lines. This system directly serviced 350,000 square¹¹ miles or 10% of the land area of the United States. Access into the city was further aided by the Collinwood Yards, which at the time of their construction had the nation's largest railroad repair shop and the nation's largest gravity switching¹² facility.

The Cleveland automobile industry drew its early customers from the local area, so it did not depend, at first, upon this rail service. But as the industry prospered and the national market for automobiles expanded in the first decade of the 20th century, the larger Cleveland companies moved to new factories located along rail lines. A large number of these factories stood along the Lake Shore and Michigan Southern tracks to the east and west of the downtown, while a smaller group located along the New York and St. Louis line to the southeast. This clustering

of factories within roughly five areas reveals the importance of the railroads in automobile manufacturing.

Cleveland's railroads provided more than shipping facilities to the automobile companies. By 1910, the larger manufacturers had moved to the edge of the city, away from residential areas and toward the expansion possibilities of undeveloped farm land. This, of course, posed a problem for the workers. Some quit their jobs, unwilling to travel "too far out in the wilderness." Others took the interurbans which traversed the city's major arterial roads and, due to the efforts of Mayor Tom L. Johnson, cost only 3¢ a ride.

Although railway service was a deciding factor in the rise of Cleveland's automobile industry, the city's proximity to natural resources became increasingly important as the industry grew. For example, Cleveland stood at the center of the great shipping corridor between Minnesota's iron ore mines and Pennsylvania's and Ohio's coal fields. Those raw materials were eventually fed directly to the foundries and power plants of the city's larger automobile companies.

While Cleveland's industry eventually developed a national market, the city's own population remained an important influence on the industry's character. The city's other industries had created a large skilled-labor force. Cleveland's "healthy ... labor market" allowed automobile manufacturers to begin production quickly without searching for skilled people or training those unskilled. Many of the early Cleveland auto makers themselves

began as skilled laborers. Alexander Winton had received his mechanical training as a superintendent for the Phoenix Iron Works while Walter C. Baker and Rollin H. White had learned their skills, in part, working for their fathers' White Sewing Machine Company.

Cleveland's wealthy population patronized the city's automobile companies with the same "local pride" that bred their support of the earlier Cleveland carriage industry. Mayor Tom L. Johnson and many prominent Cleveland industrialists drove Winton motor carriages because of the gasoline cars' power and speed. Exclusive department stores such as Higbees and Mays favored White steam trucks because of their reliability. Women, on the other hand, favored the Cleveland electric cars - Rauch and Lang, Broc, Baker - which were quiet and easy to handle.

As a sign of their support, wealthy owners of "self-propelled pleasure vehicles" founded the Cleveland Automobile Club on January 8, 1900. It was one of the first of its kind in the country. The founders, many of whom were automobile manufacturers, intended it as a social club to promote the "sport of motoring." Yet, the club did not have much promoting to do. On February 1, 1903, at the time of Cleveland's first automobile show, the Cleveland Leader boasted that "Cleveland is the leading automobile manufacturing city in the universe ... More automobiles are owned by individuals of Cleveland in proportion to population than in any other city in the world, and most of these are Cleveland made."

Such bragging reveals the kind of support the automobile industry received from the local newspapers. The Cleveland Plain Dealer sponsored Alexander Winton on two reliability runs, one²⁰ to New York in 1899 and the other to San Francisco in 1901.

Charles B. Shanks, the nation's first automobile editor, accompanied Winton, sending back daily reports on the two record breaking runs. This not only attracted the interest and support of many Clevelanders; it proved to be the turning point in the public's acceptance of the automobile.

Cleveland's banks and other industries also supported the early automobile industry. Eager to add one more industry to the city's diverse list, the banks readily extended loans to the early auto makers for plant expansions. In the first decade of the 20 century, Cleveland contained the nation's largest electric automobile factory, the nation's largest steam automobile factory, and one of the nation's largest gasoline automobile factories. Although each of these factories encountered construction delays, none were due to a lack of financing.

Cleveland's industries also had financial investments in automobile manufacturing. Firms such as American Ball Bearing and White Sewing Machine Company directly spawned automobile companies. Other companies, such as General Electric, National Electric Lamp Company, and later, the Aluminum Corporation of America supported auto manufacturing in Cleveland with stock investments, direct grants, or technical assistance.

One final reason given for the rise of the auto industry in Cleveland remains the least tangible and the most controversial. Let's call it - the New England myth. Some historians have noticed that Steven Duryea developed the nation's first automobile in Massachusetts, that Massachusetts and Connecticut contained the greatest number of automobile companies at the end of the 19th century, and that the automobile industry, in the early 20th century, extended across upstate New York, northern Ohio, and southern Michigan, following the westward migration pattern of the New England settlers. Other historians have emphasized the Anglican or New England ancestry of many early auto makers, including Clevelanders such as Winton, White, and Baker. Many of these historians have then concluded that the "New England stock" has been responsible for establishing the automobile industry in America.

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That explanation no longer seems convincing. First, the "New England stock" has never been, nor can it be, adequately defined. Second, the notion that this stock had some inbred genius for toolmaking and invention seems absurd in light of our knowledge about genetics and culture. Third, the westward migration of the industry had more to do with its access to suppliers and customers than with any pattern of New England settlement.

Unfortunately, the myth continues. Richard Wager, in Golden Wheels, reiterates the idea when discussing the decline of the Cleveland automobile industry. "A major reason for Cleveland

falling behind Detroit was the tight-money policy of Cleveland²² bankers, who were of conservative New England stock." Although this explanation contradicts the former adulation of New Englanders, Mr. Wager falls prey to the same ambiguous notion of a New England stock. This study hopes to show that Cleveland's automobile companies rose and fell for many different reasons - reasons based upon economic, technological, and social changes, not upon cultural stereotypes or regional myths.

Cleveland's automobile industry experienced three major periods of development. The first period lasted about nine years from 1898 to the recession of 1907. A large number of Cleveland automobile companies arose during that period, each offering some new mechanical innovation or design feature in their automobiles. Few survived longer than two years. The second period, lasting then years from 1907 to America's entrance into World War I, saw the growth and maturation of those companies that survived the 1907 recession and the establishment of the major post-war companies. Innovations in factory design and manufacturing methods characterize this era. The third period lasted about fifteen years, from 1917 to the Depression in the early 1930's. That third period brought the diversification of many early Cleveland automobile companies and the eventual failure of the city's remaining industry. Innovations in automobile design, as well as in factory architecture and manufacturing processes occurred during this third stage, although the innovations were adopted industry-

wide rather than held by any one company. It is difficult to make a generalization about these three periods. Suffice it to say that the Cleveland automobile industry began as a diverse collection of small-scale, localized companies and ended as a subsidiary to a few, large-scale, international corporations.

With that overview, let us look more closely at the industry's early development. Between 1898 and 1907, three modes of power - gasoline, steam, and electricity - completed for dominion within the Cleveland industry. The gasoline automobile companies held the honor of being the oldest with the Winton Motor Carriage Company as the nation's first regular
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large-scale manufacturer of cars. Two other gasoline automobile companies in Cleveland produced some of the industry's more expensive models - the F. B. Stearns Company and the Peerless Motor Car Company.

The majority of Cleveland's gasoline car producers did not last long enough to acquire any reputation. History might have forgotten these companies completely had it not been for their innovations later adopted by the industry as a whole. For example, the Washburn Motor Vehicle Company initiated a combined gasoline and electric dynamo; Marr, a jump-spark ignition; Rogers and Hanford, a four-cylinder pancake engine; and Krastin, s
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flexible steering column.

The Cleveland steam car producers, although fewer in number, met with notable success. The White Sewing Machine Company (later

The White Company) dominated the field, becoming one of the largest steam car manufacturers in the country and, for many years, "Cleveland's largest independent manufacturer in any field."²⁵ The Hoffman and Eastman steam cars trailed far behind White's production level. The Hoffman Company eventually switched to gasoline car production and the Eastman company went out of business.

Cleveland also nurtured a large number of electric car companies, two of whom, The Baker Motor Vehicle Company and The Rauch and Lang Carriage Company, merged to become one of the largest in the country. The electric automobiles appealed to a wealthy clientele, emphasizing expensive materials and craftsmanship rather than power or speed. That emphasis proved remarkably successful, through the first two stages of the Cleveland industry's growth.

The manufacturing methods of the companies between 1898 and 1905 differed little from methods employed in the bicycle and carriage industries. The companies bought most of their parts from local suppliers, although a company as large as Winton eventually supplemented that with its own foundry and blacksmith shop. Hand laborers distributed the parts on carts to the different departments - machining, painting, trimming, and assembly. The methods of producing sub-assemblies within these departments remained fairly crude. The machine shops used standard belt-driven equipment while the paint, trim, and

assembly shops relied upon common construction tools. The work demanded both time and skill, since the simple tools and machinery allowed a large margin for error.

Once the various sub-assemblies - engines, bodies, frames, wheels, upholstery - were complete, laborers pushed them on carts or hoists to a central assembly area. There, teams of workers placed the frames on saw-horses and brought the various components to the assembly area. After completing this stationary assembly, other employees made a final inspection and a test run on a company track or on a nearby road. Most sales occurred directly from the factory to informed customers who often traveled from neighboring states to examine the new motor vehicles.

The factory buildings themselves contributed to the inefficient methods of the early automobile industry. In the words of one eye-witness, "little wood-frame structures have been
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cramped full of valuable machinery and skilled machinists." Cleveland's earliest automobile factories usually encompassed a cluster of one or two story, wood frame buildings with brick bearing walls, wood sash windows, segmentally-arched openings, and occasional skylights. Offices and various departments within the factory were separated by wooden partitions. Light came from incandescent fixtures hanging in factory shades from the ceilings; ventilation, from open windows.

These conditions varied among the different companies. In the Rauch and Lang factory, the various departments stood in a

vertical relationship within four story buildings as a result of a cramped urban site. Elevators and elevated bridges connected the various floors and buildings. The Winton company factory provided a more typical model. The separate one and two story buildings each contained a different department, arranged according to the linear assembly process from foundry and blacksmith shop through machining and trimming to final assembly, testing, and shipping.

The Winton and the Rauch and Lang factories were larger and more sophisticated than the majority of automobile plants completed during the industry's first period. Most Cleveland auto makers worked in make-shift barns and warehouses. These often stood on inconvenient side streets, designed originally for other industries. Why did the early manufacturers maintain such crude manufacturing facilities? First, without a substantial market or sufficient capital, these early companies had to accept whatever they could find - and afford. Second, many of the first auto makers were mechanical engineers, more concerned about their automobiles than with their production methods or facilities. The industry, in its first period of growth, remained product rather than process oriented. Third, the manufacturing processes had not become specialized enough to demand anything more than the standard late-19th century industrial structure. Separate, brick-walled, wood-framed, gable-roofed buildings had sufficed for the manufacture of bicycles and carriages. At first,

they worked equally well for the motor carriage.

Indeed, the forms of these early factories almost seemed to determine the manufacturing processes within. For example, when the Winton Motor Carriage Company built its second factory in 1903, the company constructed a cluster of brick buildings that differed little in type or arrangement from the company's earlier facility. Winton had adopted its methods to a particular type of structure and seemed unwilling to change to something more efficient even when confronted with an opportunity to do so. This conservatism says much about the type of people who founded the early automobile industry in Cleveland. Most were inventors and engineers, concerned more with mechanical problems than with selling automobiles in large quantities for huge profits. The early companies thus advertised the quality and reliability of their product, not the speed of its construction or the lowness of its price.

The skilled labor shared many of the same values. Teams of men usually assembled each motor vehicle from scratch. They thought of themselves as "artisans."²⁷ Close working relations and personal bonds often developed within each company, making strikes and labor disputes uncommon. The companies responded by advertising the long-term employment of their workers.

Such labor relations, however ideal, remained short-lived. Just as the Cleveland automobile industry established a good market for itself, the methods and facilities, as well as the

very character and tempo of the industry began to change.

By 1907, the Cleveland auto industry had reached a second period in its growth. A majority of the early companies had failed or would fail during the recession of 1907. A few companies with sufficient capital - Winton, Peerless, Stearns, Gaeth, White, Baker, and Rauch and Lang - survived. The trend toward a few large-scale producers had begun.

In the 1907 to 1917 period, the three modes of power - gasoline, steam, and electricity - remained competitive. Mechanical innovations within the automobiles themselves continued at an even pace, although improvements in factory construction and manufacturing methods greatly increased during this second period.

By 1907, Detroit had pulled ahead of Cleveland as the nation's leading automobile manufacturer, with fourteen major companies compared to Cleveland's seven.²⁸ Henry Ford changed the course of the industry almost single-handedly. His production of the Model T in 1908 had turned motoring from a sport for the wealthy to a necessity for the middle-class by 1917. Ford emphasized the speed and efficiency of production rather than the expense of materials, the level of craftsmanship, or the loyalty of workers. With his use of gravity chutes, assembly lines, and specialized machinery, the process of manufacturing became as important as the product made. The "systematic combination of accuracy, speed, and volume" soon replaced the

stationary, hand-crafted methods which treated each automobile
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"pre-eminent as a work of art."

The Cleveland manufacturers responded to Ford's innovations in contradictory ways. Most did not lower the price of their automobiles. The patronage of wealthy Clevelanders may have convinced the local auto makers that the high-priced market remained strong. Indeed, many Cleveland manufacturers increased the cost and luxury of their automobiles. Having lost their lead to Detroit, they thought that, by devoting themselves to the remaining high-priced market, Cleveland might remain the nation's leading manufacturer of expensive automobiles.

On the other hand, Cleveland's automobile industry did adopt Ford's concern for manufacturing processes. The major Cleveland companies realized that if they were to remain competitive, even in the high-priced market, they would have to eliminate the inefficiencies of their former methods. The rapid development of new assembling techniques and factory architecture within the Cleveland industry occurred at an increasing pace during the second period. The results were as innovative as they were varied.

The Cleveland industry still bought many of its parts from local suppliers. But, as the companies moved into new facilities and expanded their operations, they increasingly made their own components in their own foundries and shops, relying upon other industries simply for raw materials such as steel, rubber, glass,

leather, and wood. The larger Cleveland auto producers, also continued to use the method of stationary assembly; but refinements in the machining and handling of materials reduced the amount of hand labor and sped up the assembly process. For example, the F. B. Stearns Company greatly increased the number of belt-driven machines in its new factory. Closely spaced stirrups, holding regular rows of motor-driven shafts, also allowed more flexibility in the placement of machines.

Innovations in materials handling included the use of electric cranes and trolley hoists for the moving of heavy raw materials or sub-assemblies, carts attached to moving rails for the transportation of parts, and inclined chutes for moving components among assembly areas.

The largest single innovation came with the establishment of single-flow operations. Instead of the earlier method of assembling components in separate and often unrelated areas of a factory, single-flow operations placed related machinery and related departments in a logical and often linear sequence, allowing parts to move through the manufacturing process with a minimum of time and effort. After 1905, the Cleveland automobile industry began to coordinate its methods rather than let those methods be determined by the physical plant itself.

That, of course, had an enormous impact on the design of the automobile factories. The period between 1905 and 1912 found most of the major Cleveland automobile companies building

new plants. Of these, Winton and Rsuch and Lang simply expanded the factories that they had built prior to 1905. Reluctant to change their established methods, both companies maintained the earlier types of factory construction and building arrangement in their new additions. That decision proved costly, indeed fatal, for both companies later on.

Other leading manufacturers - Baker, White, Stearns, and Peerless - had outgrown their original facilities by 1905. Rather than simple expand or alter the old factories, they all built new structures during the second period different from and often distant from their existing plants.

Unlike the fairly uniform design of the earlier plants, these new factories differed from each other in both their design and construction. The new Stearns plant utilized the traditional mill construction with its brick bearing walls, timber structure, and solid wood floors, but followed a multi-story arrangement to minimize the distance and difficulty of handling the components. Peerless maintained the earlier standard of separate, monitor-roof buildings, but it built them of steel and set them in a close and related sequence, later connecting them with bridges and arcades. Baker took a major step by placing its new single-story, brick factory under one roof with an attached, multi-story office structure, even though its timber construction and saw-tooth roof remained holdovers from the past. White elaborated upon the Baker format, of a saw-tooth roof

factory and an attached office building. The White plant differed in its use of steel and reinforced concrete construction and its arrangement of separate departments along an enclosed craneway.

The location of the new factories differed from the older plants. Stearns, because its existing site stood at the fringe of the city near a rail line, built its new plant next to its old. Peerless, Baker, and White, on the other hand, all moved from their earlier inner-city locations to new sites at the edge of the city with rail sidings on major trunk lines. This gave the companies room to expand and freedom to test their often noisy vehicles.

The major Cleveland auto makers, because of their growing concern for their manufacturing methods as well as for their public image, hired established architects and engineering firms for their new facilities. Stearns hired the local architect, Abram Garfield; Peerless J. Milton Dyer; White, George H. Smith; Baker, the Corlett Engineering Company. These architects and engineers, better known in Cleveland for their residential and commercial buildings, not only designed the company offices, they also developed manufacturing layouts, structural innovations, and expansion plans for the factories.

This patronage of architects testifies to the progressive character of the Cleveland automobile industry in this second period. Never again would local architects have such a voice in

the design of Cleveland automobile factories. Never again would Cleveland's automobile industry turn to such nonspecialized designers for its architectural solutions.

The progressive character of the Cleveland industry after 1907 applied to its labor relations as well as its factory designs. The rapid expansion of the industry in this second period demanded an increase in the speed of production and an increase in the specialization of each worker's task. At the same time, it demanded that the company officials move out of the factory into office buildings. The industry's prosperity thus increased the worker's anonymity. To counteract that trend, companies instituted programs to inform, educate, and entertain the workers. For example, The White Motor Company involved its employees in company decisions through elected representatives on its board of directors and through its publications, The White Book and The Albatross. The company also operated lounges, recreation fields, classrooms, and a public library for the workers and their families.

With the onset of World War I, the Cleveland auto industry entered a third stage in its development. This third period, lasting 15 years from 1917 to 1932, brought major changes in the methods, facilities and labor relations of each company, as well as in the automobiles themselves.

By 1917, the gasoline engine had become the dominant mode of powering automobiles. The introduction of the electric ignition

systems had doomed the steam and electric car industry, making the gasoline automobile as convenient as it was fast and powerful. After 1917, Cleveland automobile companies produced gasoline cars. The steam and electric car manufacturers had either switched to gasoline production or merged with their competitors, or entered other industries.

The period from 1917 to 1932 also witnessed a steady increase of competition from companies controlled by out-of-town interests. By 1917, ten of these companies controlled 75% of the national automobile market; by 1923, 90%. This outside competition existed in Cleveland both at the retail level, with out-of-town companies controlling over 40 Cleveland automobile agencies within the city, and at the manufacturing level, with outside interests purchasing major firms such as the F. B. Stearns Company or opening branch assembly plants within the city.

Cleveland's auto manufacturers reacted to this competition in different ways. Some such as Winton, Baker, and White refused to compete, exploring other fields for manufacturing opportunities. Winton became a diesel engine manufacturer; Baker, a producer of electric lift vehicles; and White, the nation's leading manufacturer of custom gasoline trucks.

Some new Cleveland automobile companies tried to undersell the Detroit competition. The Chandler Motor Car Company, founded in 1913, came out that same year with a six cylinder car at a new low price. Chandler's later subsidiary, the Cleveland Automobile

Company, also successfully competed within the low-price market.

A majority of the Cleveland automobile manufacturers continued to vie for the shrinking high-price market. Each justified the expense of its automobiles by offering various mechanical and stylistic innovations - the Templar with its sports car sleekness, the HAL Twelve with its twelve cylinder engine, the Richard with its boat-tail trunk, or the Pomeroy with its mostly aluminum body. The high-priced market, however, was not large enough to sustain so many competitors. Most of the Cleveland automobile companies founded in this third period lasted under
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seven years.

The Cleveland industry reacted to the manufacturing innovations of the Detroit companies in different ways. For example, Peerless continued its automobile production using methods developed during the first phase of the industry - stationary assembly, hand-crafted bodies, and complex machining operations. Those methods as much as its use of expensive materials, maintained the Peerless automobile as one of the most costly in the nation.

The Chandler and Cleveland companies, on the other hand, adopted many of Ford's methods during the third period. For example, the two companies used Ford's idea of multi-story factories and gravity assembly. Raw materials and parts went by elevator or crane to the top floor for storage. The middle floors contained moving assembly lines which pulled the various sub-assemblies through their respective departments to hoists, which lowered the

components to assembly lines below. The ground floor of these plants contained the final assembly, inspection, and shipping departments. Adjacent buildings often contained more autonomous departments - machining, painting - within single-story structures.

Oddly enough, Ford's own branch assembly plant in Cleveland did not fully employ the company's own assembly techniques. The Ford plant did use elevators and a crane to move components from the second level train tressle to the various floors. However, the plant, because of its small size and its limited use for final assembly, employed few moving assembly lines and apparently, no through-the-floor hoists.

Chandler approximated Ford's vertical integration by forming reciprocal contracts with body and parts manufacturers such as the H. J. Walker Manufacturing Company and the Briggs Manufacturing Company. Each company gave Chandler supply priority in return for Chandler's patronage. Chandler also followed Ford in its use of specialized machinery tooled to perform single operations at a rapid pace. Only through such adaptations did the Chandler Motor Car Company succeed when so many other Cleveland companies failed.

The manufacturing methods developed after 1912 brought major changes in the design of automobile factories. Similarly, refinements in factory construction wrought changes in production methods. For example, the idea of a vertical movement of components through gravity assembly necessitated multi-story structures.

When that method was first developed around 1910, reinforced concrete design had just reached its maturity. Prior to that date, building codes such as Cleveland's had prohibited concrete structures over four, and later over six stories. Thus the vertical assembly of automobiles arose with reinforced concrete construction, a system sturdy enough to support heavy loads.

These third period factories differed from the predecessors, not just in height and material, but in their proportions. The assembly line process determined the extreme length of the factories while ventilation and lighting requirements determined their narrow width. For example, the Cleveland Automobile plant was eleven times long as it was wide. The length of these factories also accommodated parallel rail sidings for the direct loading and unloading of trains. Those sidings stood outside of the plants, as in the Chandler and Cleveland factories, or inside, as in the Ford branch assembly plant.

The automobile plants built during this third period developed standardized structural designs. The majority of Cleveland factories employed reinforced concrete with mushroom columns, drop capitals, and flat slabs and a non-structural infill of brick spandrels and metal-sash industrial windows. The structural bays usually stood 20 feet on center with twelve to fifteen foot ceilings. The various Cleveland factories built along these lines - Chandler, Cleveland, Ford, Fisher Body - differed only in their arrangement of these standard elements.

While this visual uniformity may have been an apt symbol for an increasingly centralized industry, it remained the most common solution of architects and engineers who specialized in automobile factory design. Ernest McGeorge, a Cleveland engineer, designed the Peerless, Chandler, and Cleveland plants while Albert Kahn and Associates, a Detroit firm, designed the Stearns, Ford, and Fisher Body facilities. Although their designs contained innovations such as the central glass-enclosed court at Peerless or the in-column ventilation system at Stearns, those innovations remained at a detail level.

The location of automobile factories also changed during this third period. Because of its reciprocal contracts or its outright purchase of suppliers, the Cleveland automobile industry began to place its factories in industrial parks, near its related companies. For example, The Chandler Motor Car Company stood attached to the H. J. Walker Manufacturing Company, next to the Briggs Manufacturing Company, and near the Fisher Body Company - all Chandler suppliers.

The physical distance that separated Cleveland's residential areas from these factory developments also existed at a psychological level between the automobile workers and their jobs. The automobile industry in this third period increasingly used money rather than educational opportunities and recreational facilities as a compensation for the routine of assembly line work. This tendency, of course, varied within the industry. The Chandler

Motor Car Company, as late as 1925, still boasted of the recreation³⁴ rooms, tennis courts, and cafeterias it provided for its employees. But Henry Ford's decision in 1914 to pay his workers \$5 for an³⁵ eight hour day, set the trend toward monetary compensations. Such generous pay attracted workers, but it did not stop the development of labor unrest. Job security and satisfaction remained an issue as in the 1936 strike at Cleveland's Fisher Body plant, when 7000 workers staged a sit-down protesting, among other things,³⁶ the lack of job security.

Those events lie beyond the scope of this study for, by 1932, the early Cleveland automobile industry had come to an end. Stearns failed in 1924. Cleveland failed in 1926 and Chandler in 1929. Peerless ended production in 1931 and Ford ceased operations at its branch assembly plant in 1932.

What led to this precipitous decline of Cleveland's auto industry? Before answering that question, some qualifications are in order. First, Cleveland's role in the automobile industry did not end completely in 1932. Cleveland remained a major supplier of automobile parts. The Fisher Body plant continued to produce bodies for General Motors while Cleveland's iron and steel industries continued to supply materials and parts to various Detroit automobile companies. Cleveland also remained a center for the production of specialized vehicles and engines. Winton continued to produce its diesel engines as a subsidiary of General Motors; Baker continued to manufacture lift trucks as a subsidiary of Otis

Elevator; and White remained a leader in the custom truck and bus industry.

Second, the ending of the Cleveland automobile industry did not occur suddenly. Cleveland companies had failed almost continuously over the 34 year history of the industry. Although many failed during the recessions of 1907 and 1921 and the depression following the 1929 stock market crash, changes in the economy, along, cannot explain the decline of the Cleveland auto industry. Technical changes within the larger automobile industry had a more direct effect.

By now, those changes might be familiar. The custom production of high-priced motor carriages in single story wood-frame buildings gave way to the mass production of low-priced automobiles in multi-story concrete factories. The input of local architects and contractors gave way to the uniform stamp of automobile factory specialists. Company loyalties and group assembly gave way to assembly line work for high wages. Finally, the competition of many small-scale producers gave way to the consolidation of a few large corporations. Although these changes encompass many exceptions, they do suggest the general direction of the automobile industry between 1898 and 1932.

The question that needs answering is why the Cleveland automobile industry could not adapt to those changes, for therein lies the reasons for its decline. Ironically, the Cleveland industry declined for many of the same reasons that it arose. In other words,

the forces within the city that supported the industry's early development became the very forces that hampered its later growth.

For example, Cleveland's diversified industrial base hindered the vertical integration of the city's automobile industry. While the two largest Detroit auto makers, by the 1920's controlled most of their raw materials and parts suppliers, Cleveland's largest auto makers never gained control over the city's large

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steel and machine parts industries. In an industry where self-sufficiency increasingly meant survival, the Cleveland auto maker's dependence upon suppliers became a major liability by the 1920's.

As the Cleveland industry lost its ability to compete, so too, it lost its support from the city's newspapers and banks. Cleveland's newspapers continued to give news coverage to the city's automobile industry, but the earlier chauvinistic pride was gone. The papers realized that the Detroit companies had a more realistic view of the market. As early as 1909, one Plain Dealer writer summed up that view with a statement that, "for every man able to pay \$4,500 for a pleasure car, there are hundreds in the position to afford from \$500 up to \$1,000." 38 Local support for Cleveland's high-priced auto industry fell before economic realities.

Cleveland's banks also withdrew their support from the Cleveland industry when it disregarded the city's manufacturing diversity. For example, the earlier Cleveland automobile companies - Winton, Baker, White - had no difficulty securing loans for their new factories. But, as the Chandler Motor Car Company adopted the

techniques of the Detroit companies - forming subsidiaries, signing reciprocal agreements, greatly expanding its factory - Chandler had to seek its financing from New York banks.

The tradition of a balanced industrial economy in Cleveland thus overrode the promises of a successful automobile industry. As the Cleveland Chamber of Commerce announced in 1916, "it does not covet Detroit's leadership as being fir first automobile manufacturing city, but rather has in mind a much wider diversity of industries." ³⁹ The Cleveland automobile industry did not decline because of the "tight money policy of Cleveland bankers," or because the "city fathers saw no urgent need to encourage new manufacturing." ⁴⁰ Cleveland's bankers, for good reason, did not want the city to become a one company town. The city fathers did not want to encourage an industry which, in Detroit, had overwhelmed its own suppliers and the city's other manufacturing. The automobile industry simply demanded more financial backing than the Cleveland establishment wanted to give.

The Cleveland automobile industry suffered from internal problems. For example, the city's strong labor unions resisted the automobile industry's hiring of nonunion workers. "One of the principal reasons why Detroit (became) the center of the automobile industry lay ... in the fact that it was an open shop town." ⁴¹ Cleveland's unions resisted open shop practices out of pride as well as economic self-interest. In 1910, Charles Rauch reflected that pride when he spoke of his employees, as "artisans ... with our company from five to forty years." ⁴²

Resistance to assembly line methods often came from company officials themselves. People such as Alexander Winton, Walter C. Baker, Rollin H. White, Frank B. Stearns were more engineers and inventors than they were businessmen. Significantly, they all dropped out of automobile production when it became too quantity-oriented and routine, directing their inventiveness into less crowded fields - diesel engines, lift trucks, and tractors.

Perhaps their leaving was fit for the best since poor management was one of the major reasons for the decline of the Cleveland industry. In the 1920's, the F. B. Stearns Company overextended itself, standing at the edge of bankruptcy when it could not pay back the bonds taken out on its new factory. Peerless, in the same period, had six different presidents, many of whom showed a loss for the company or alienated the stockholders. Misjudgment of the market and a misuse of funds remained a common theme throughout the industry's history.

But such common themes tell only part of the story. Nothing less than a detailed examination of the major companies can complete the history of the Cleveland automobile industry, for each company rose, prospered, and fell in very different ways, for very different reasons. Why and how that happened will be the subject of the following studies.

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